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I, JANENE PEISKER, TEAM LEADER EXAMINATION SUPPORT AND SALES hereby certify that annexed is a true copy of the Provisional specification in connection with Application No. 2004900186 for a patent by WET AND JUICY PTY LTD as filed on 15 January 2004.

WITNESS my hand this
First day of February 2005

JANENE PEISKER
TEAM LEADER EXAMINATION
SUPPORT AND SALES

AUSTRALIA

Patents Act 1990

PROVISIONAL SPECIFICATION

Applicant(s):

WET AND JUICY PTY LTD

Invention Title:

WATER PURIFICATION PLANT

The invention is described in the following statement:

WATER PURIFICATION PLANT

The present invention relates generally to water treatment and in particular to water purification. More particularly the present invention relates to the use of filter material such as diatomaceous earth to filter unwanted materials, substances, biological matter or the like from water such as for example to produce treated water, particularly drinking water. Even more particularly the present invention relates to a compact self contained versatile unit for purifying water by passing the water through a combination of sterilizing agent and filter material in which the unit is easier to operate, particularly by untrained operatives, than are existing purification units, whilst still producing acceptable quality drinking water. The present invention finds particular application as a self contained portable water purification unit that is easy to condition, ripen, prepare, run and/or operate and that provides exceptional quality drinking water by using a combination of diatomaceous earth and sterilizing agent in the form of chlorine or a chlorine containing compound to remove unwanted materials from water including particulate material and biological matter such as for example Giardia and Cryptosporidium.

Although the present invention will be described with particular reference to one embodiment of the present invention it is to be noted that the scope of the present invention is not limited to the described embodiment but rather the present invention is more extensive in scope to include other forms and arrangements of the unit, other uses of the unit and the use of different materials in the unit.

One problem of existing water purification plants is that they are fixed in place which makes it difficult if

not impossible to transport them. Another problem associated with existing plants are that they are difficult to use and overly complex. A further problem of existing water purification plants is that the quality of water produced by such plants is not acceptable. Another problem of mobile water purification plants is that they are heavy, cumbersome and difficult to transport. Another problem of existing purification units is that it is difficult and time consuming to add or load chemicals to the unit and/or to condition or ripen the unit prior to operating the unit to produce acceptable quality drinking water. Another problem of existing units is that they are not versatile or flexible in their use and/or are not provided with removable components.

The present invention sets out to provide a modular self contained portable minimal maintenance easily operated water purification plant providing quality drinking water that has at least one component that is separately removable from the main unit.

According to one aspect of the present invention there is provided a transportable water purification unit comprising a first subassembly which is a pumping unit capable of pumping water to, through and from the unit and a second subassembly which is a filtering unit capable of filtering biological matter and particulate matter from the water by passage through the filtering unit wherein the pumping unit is demountable from the purification unit and is capable of operation independently of operation of the purification unit.

One form of the water purification plant of the present invention has been designed to treat water that is polluted with suspended solids and biological matter such as bacteria or the like to provide potable water particularly in the field or whilst travelling or the

like. The unit of the present invention is primarily designed to provide potable water in situations such as war, natural disasters, fire, adverse weather conditions, refuges, refugee camps, or the like where poor quality or undrinkable water is available to that using the purification unit can produce water that is of an acceptable standard of cleanliness to be able to be drunk.

One form of the purification plant of the present invention which is referred to as the DE6000 water purification plant purifies water at a flow rate of 1,500 GPH. It will filter out solid particles to less than 1 micron and therefore will remove Giardia and Cryptosporidium from the water down to levels greater than 3 log. Giardia and Cryptospordium are bacteria present in water that is unfit to drink by causing ill health. In addition to using chlorine to sterilize/disinfect the filtered water other disinfecting/sterilizing agents can be used, such as chemical agents, ultra violet radiation, or similar.

The present invention will now be described by way of example with reference to the accompanying drawings in which:

Figure 1 is a front view of one form of the water purification plant of the present invention.

Figure 2 is a front and one end view of the water purification plant of figure 1.

Figure 3 is a front and other end view of the water purification plant of figure 1.

Figure 4 is the other end view of the water purification plant of the present invention.

Figure 5 is a rear view of the water purification plant of figure 1.

Figure 6 is a flow chart of the water purification plant of figure 1.

Figure 7 is a schematic view of a control panel of the water purification plant of figure 1.

The DE6000 is a self-contained unit comprising two main sub-units, which are the diesel pump and the diatomaceous earth (DE) filter unit. DE is a fine crystalline silica powder derived from fossilized marine animals.

The diesel driven pump is a separate module that is self contained within itself and is removable from the purification unit so as to be able to be used by itself as a water transfer pump rated at 12,000 GPH (200 GPM), such as for example as a water pump to fight bush fires. It can also be used for fire fighting when fitted with modified nozzles. It has a basket strainer that will remove particulates larger than 1/16" (1.6mm) from the stream of contaminated water being introduced into the unit.

The unit is also provided with a suction line for introducing water from the raw water source. The suction line comprises a check valve/strainer with support ring that is placed in the raw water source. To this are connected three suction hoses and these are then connected to the basket strainer. Thus, raw water can be readily introduced into the purification unit.

The DE filter unit consists of DE makeup tank, DE filter, chlorine dosing pump, chlorine storage tank, valves and pipework for operation of the system. All of

these components are fitted to the main frame which is provided with a carrying handle and a skid plate or pair of skids or the like. It is to be noted that the pump assembly is provided with its own skid plate or skids for use when the pump is used separately.

Specifications of the DE6000 Unit

Dry weight:	about 380 kg; (840 lb)
Crated weight:	about 428 kg (945 lbs)
Temp range:	about 0°C to 60°C (32°F to 110°F)
Dimensions uncrated:	about 900mm wide (35.5"wide), 1800mm long (70.9" long), 1060mm high (41.7" high).

Capabilities

Flowrate: 6,000 L/hour (1500 GPH)

Removes turbidity and suspended solids down to particle sizes of less than 1 micron.

Residual disinfection: achieved by dosing Calcium hypochlorite at up to 8 ppm through the unit.

Features

A modular system for easy removal of pump unit.

A simple 2-stage DE makeup system without complicated pilot lines that are susceptible to blockages.

Simple chlorine dosing system.

Easy to operate.

Self controlling constant filtration rate.

Main module

Skid frame with protective bars

DE makeup tank

DE filter

Chlorine tank

Chlorine dosing pump

Hoses

Suction hose 10' (3 off)

Treated water hose layflat 50'
Waste water hose layflat 50'

Pump module

Frame
Diesel driven pump 200 GPM
Basket Strainer

Description of Operation

The following is a general description of the operation of the DE6000 Water Purification Plant (WPP). Detailed operation is described later in this specification.

Diatomaceous earth (DE) filtration is an effective means of filtering water to remove particulates down to a very small size. By using the specified diatomaceous earth substantial removal of particulates to less than 1 micron is achievable.

In the DE6000 Water Purification Plant (WPP) DE is placed in the DE makeup tank while the system is running and is transferred onto the septum (cloth covered frame onto which the DE is deposited) of the DE filter where it builds up as a layer, covering substantially all of the entire area of the filter.

The DE6000 WPP uses a layer of fine DE as the main filtering media and a thinner layer of coarse DE to extend filter life.

After the DE has deposited onto the filter initially the filter needs to ripen. Ripening of a filter means to run it for a period of time, usually 5-10 mins, to let the DE settle and to allow some of the particulates to build up on the DE which increases the filtration of the water being treated.

During the ripening period the chlorine solution can be prepared. Filling the chlorine tank with water from the hose on the unit and adding the chlorine powder achieves the production of a chlorine solution. Thorough mixing of the chlorine powder with the water ensures that it is fully dissolved.

After the filter has ripened the DE6000 WPP can be changed from discharge to waste water to discharge to the treated water storage. When this happens the inline dosing pump automatically doses the chlorine into the water to sterilize/disinfect the water.

The DE6000 WPP is a constant rate filter running at about 35 to 38 psi (240-260 kPa). When the inlet pressure gauge starts to rise above this level the filter is starting to load up and will need to be backwashed and then recharged with DE again.

Priming pump and suction hoses

Remove the lid from the basket strainer and fill with water. The collapsible bucket can be used if another source is not available. The suction hoses should be full from the foot valve all the way to the strainer.

Operation

Starting the pump

Set the valves as follows:

Valve No	Valve Description	Valve Position
V01	System inlet valve	Open
V02	DE makeup tank inlet	Close
V03	DE makeup tank drain	Close
V04	DE makeup tank check valve	No control
V05	Filter/Backwash inlet valve	Filter
V06	Filter to waste valve	Open
V07	Backwash to waste valve	Close

V08	Hose point	Close
V09	Filter/Backwash inlet valve	Filter to waste
V10	Constant flow valve	No control
V11	DE tank air relief valve	Closed
V12	Filter air relief valve	Closed

After the pump has been primed the motor is started.

Open the fuel shut-off valve on the left hand side of the engine by turning the handle downward. Move the throttle to about half way.

Press the decompression lever on the top of the pump until it stays down. If it does not stay down pull the crank cord out a little way until it does. Pull the crank cord firmly to start the engine.

Once the engine has been started the water should be flowing through the system and discharging from the waste water hose.

Open the air release valve on top of the filter until water runs out. Close the valve.

Provided with the unit are 2 bags of fine DE and 1 bag of coarse DE. The 2 bags of fine DE are used first.

To apply the DE to the filter the DE makeup tank needs to be filled with one bag of fine DE. Take the lid off the DE makeup tank and empty a bag of DE powder into the tank. Wash off any DE on the lip of the tank and the lid as the DE can make the lid and clamp jam. Close the lid firmly. Open the DE makeup tank inlet valve V02 located on the front valve plate. This will transfer the DE onto the filter. Leave V02 open for about 2 minutes, close it and then open the DE makeup tank drain, V03, located at the base of the DE makeup tank. Drain about half the water out of the tank. Close the drain valve,

take the lid off and put the second bag of DE into the DE makeup tank. Close the lid and open V02 to transfer the DE onto the filter.

Repeat the procedure for the third bag of DE.

Before closing V02 close V01 for about 30 seconds as this will flush the last of the DE from the makeup tank. Open V01 and close V02.

Ripening filter

Run to waste to for a period of time until the filter has 'ripened' and is ready to filter. This should take about 5 to 10 minutes. During this period make up the chlorine solution.

When the filter has ripened the chlorine solution can be prepared. Fill the chlorine tank with the clean water. Take the measured amount of chlorine powder (pre-measured bag) and add it to the water in the chlorine tank. Use the chlorine stirrer to make sure that all the chlorine powder has been dissolved.

Priming the chlorine pump

Before going to the filtration step it is essential that the chlorine pump is primed and does not run dry. The chlorine pump only operates when in the filtration step as it is powered by the water from the filter.

Take the tube between the chlorine pump and the chlorine tank out of the chlorine tank. Use the hose to fill this tube and try to get all the air out. Insert the tube back into the chlorine tank. When the chlorine pump is operating in the filtration step the remaining amounts of air can be removed by moving the tube.

Filtration

When the chlorine solution has been prepared the

system can be used to produce filtered water.

Turn V09 slowly to "TREATED WATER'. Filtered water will now be diverted from the waste outlet to the treated water outlet.

The chlorine solution will be mixed into the filtered water.

Turn V06 to the closed position.

When the system has been set to filter to TREATED WATER the inlet pressure gauge will read about 240 kPa (35 psi).

The outlet pressure gauge will read approx 120 kPa (17 psi).

The pressure increases as the system is changed from FILTER TO WASTE to filter to TREATED WATER. This occurs as the constant flow control valve brings the system flow back to 1,500 gpm.

Filter run times will vary depending on the amount of contaminants in the water. The more contaminants that are in the raw water the shorter the run times are.

Setting the Chlorine dose

The dose rate of chlorine will depend on the storage requirements of the treated water. A residual of 0.5 ppm (parts per million) is usual.

The dose rate is set from the following table and is the concentration of the chlorine as it leaves the filter. The residual value of chlorine in the treated water storage and in the reticulation system will depend on a number of factors and best evaluated at the very end of

the system, as this is the worst case. It is desirable to have about 0.5 ppm at this point and all the other points will be above this.

Chlorine conc'n	ppm	1	2	3	4	5	6	7	8	9
Stroke length	%	11	23	34	46	57	68	80	91	103

Adjust the dose rate and tighten the locking nuts.

Backwashing

Before backwashing make sure that the water produced from the backwash, which contains the waste diatomaceous earth (DE) and all the waste contaminants, is discharged into an appropriate container. This may be a berm or an open tank or portable dam.

V06 should already be shut. Change V09 to 'BACKWASH' and change V05 to "BACKWASH". Open V07. These valve changes need to be done quickly.

Run until the water coming from the waste hose is clear of DE.

Reset the valves back to the start up position.

Open V06, close V07, change V05 to FILTER.

This completes the full cycle and the filter is ready to run again. Either stop the pump motor until water is again required or go back to the "PRECOAT APPLICATION" step. Ensure that all the valves are in the starting position again.

Glossary

Calcium hypochlorite	disinfectant used in water treatment to maintain a residual concentration of chlorine in the storage tank.
DE	diatomaceous earth.

Ripening	ripening of a filter means to run it for a period of time, usually 5-10 mins, to let the DE settle down and to allow some of the particulates to build up on the DE which assists the filtration.
Septum	cloth covered frame onto which the DE is deposited in the filter.
Blind	when the filter starts to block up with solid particles.
Raw water	untreated water from the source, i.e. river, lake or pond.
Filtered water	raw water after having passed through the DE filter
Treated water	raw water after having passed through the DE filter and dosed with chlorine solution.
Triclover fittings	easy to dismantle clamping system used in stainless steel tubing

Advantages of the water purification plant of the present invention include the following:

- minimal maintenance,
- easy to use,
- minimal operational supervision of personnel operating the plant,
- exceptional quality of drinking water produced from the plant in that 99.9% of Giardia and Cryptosporidium is removed from the treated water,
- constant rate filtration,
- modular design,
- self powered no electrical power required,
- disinfection system standard
- highly portable.

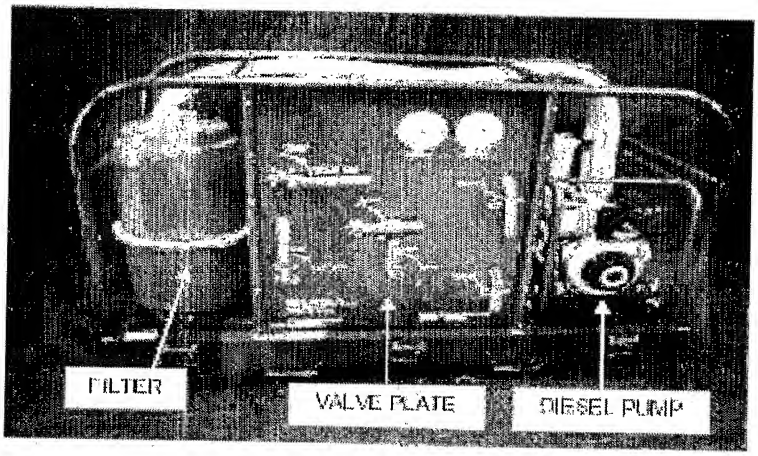

FIGURE 1

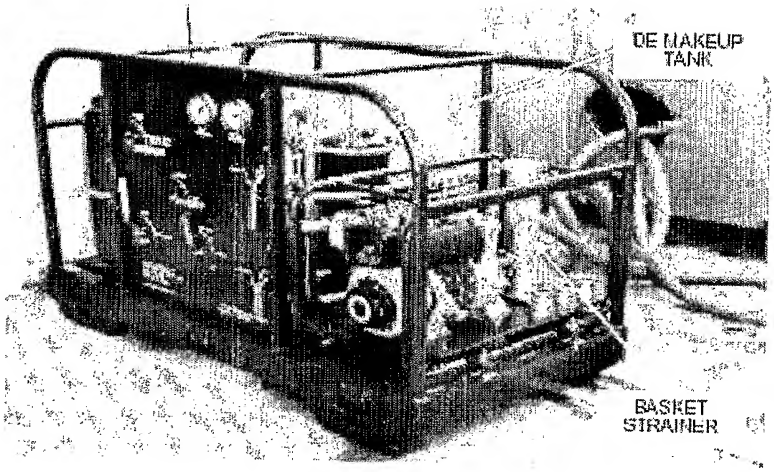

FIGURE 2

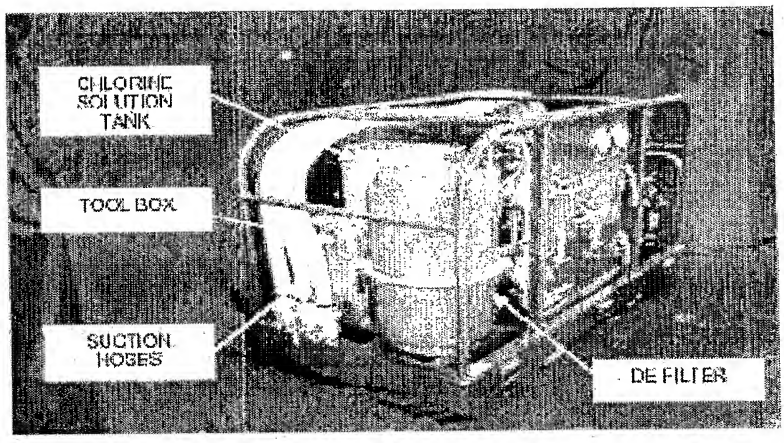

FIGURE 3

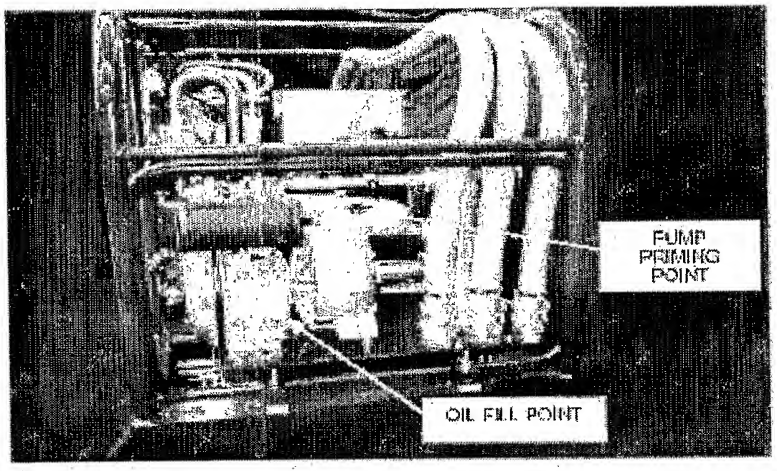

FIGURE 4

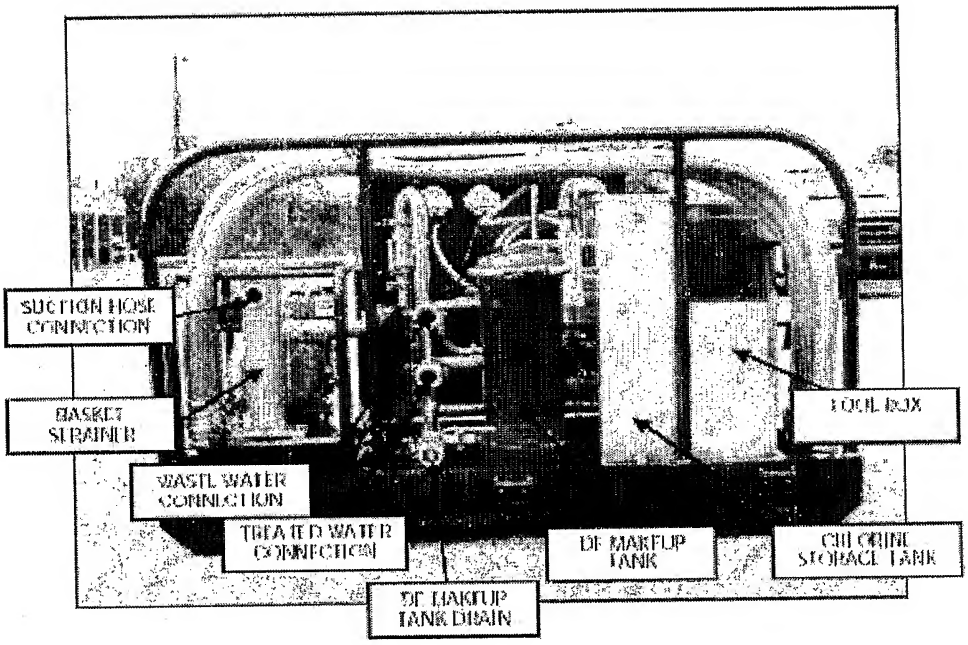
SUCTION HOSE CONNECTION
BASKET STRAINER
WASTE WATER CONNECTION
TREATED WATER CONNECTION
DF MAKEUP TANK DRAIN
DF MAKEUP TANK
CHLORINE STORAGE TANK
TOOL BOX

FIGURE 5

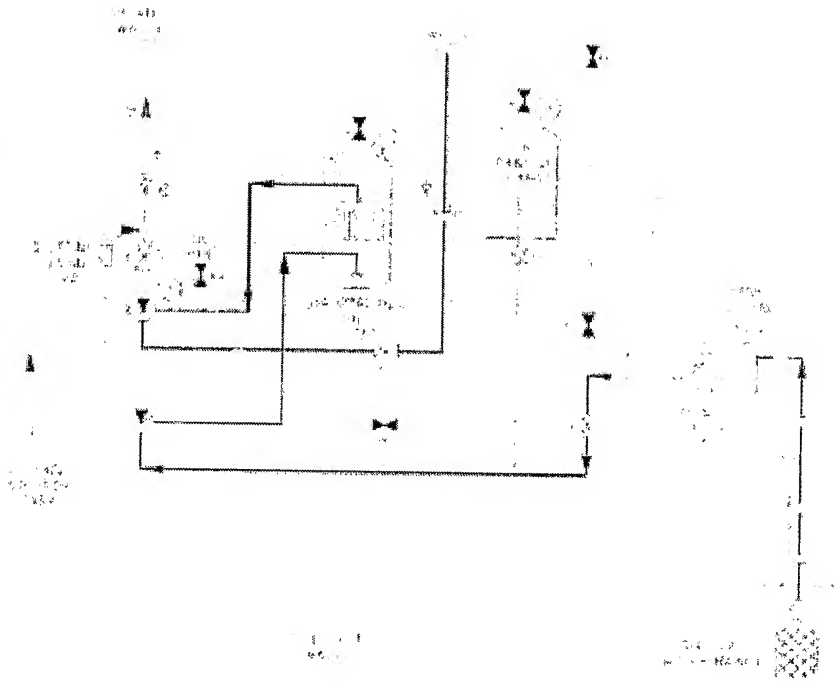

FIGURE 6

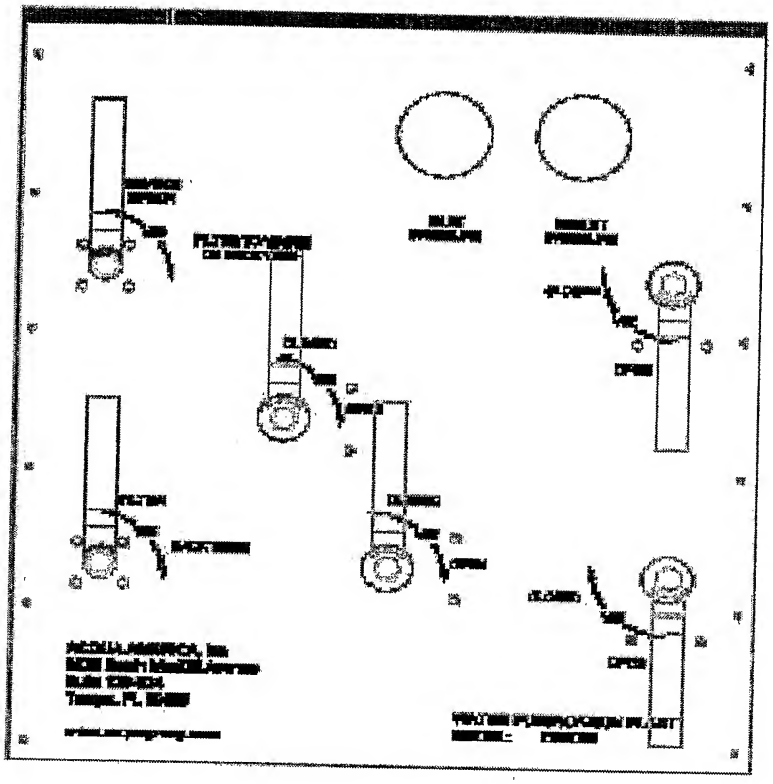

FIGURE 7